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SOME CONSTRUCTION DIRECTORS RESIST MECHANIZATION; MAINTENANCE OF EQUIPMENT POOR, REPAIRS HEAVY

V. Burgman

For every million rubles invested in construction work 10,000 - 20,000 tons of materials, depending on the industry, must be moved. The materials must go through five handling stages (unloading, storing, grading, loading, and delivery) during the course of their movement. The 3 - 4 tons of materials which must be handled every working day are much greater than the daily production totals of most branches of industry.

Building materials for the construction industry as a whole may be broken down as follows: earth, 50 - 60 percent; sand, gravel, rubble and stone, 12 - 18 percent; bricks, 7 - 12 percent; lumber, 3 - 6 percent; cement materials (cement, lime, gypsum), 3 percent; steel, 0.5 - 1.5 percent; others, about 10 percent.

When concrete and mortar are used, more working space is required than is necessary for the stone, cement and inert materials. The following figures for construction materials are then obtained: dirt (removal and haulage in excavation work), over 50 percent; concrete and mortar (along with inert and cement materials), 25 - 30 percent; bricks or slag blocks, about 10 percent; lumber and steel, not over 5 - 8 percent.

In the construction industry over 60 - 70 percent of the labor is expended on loading and unloading, and hauling and hoisting operations, whereas only about 30 - 40 percent is expended on actual construction, installation, and finishing work. These labor-consuming jobs, along with plastering, employ large numbers of nonskilled labor and must be completely mechanized.

We must admit that on certain construction jobs mechanization meets with the passive resistance of the director of the construction work, and the construction and main administrations often exaggerate the "percentage" of mechanization of their work by miscalculating.

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Complete mechanization of all construction processes is necessary to insure substantial reduction in labor-consuming work. While partial mechanization facilitates the work of labor, it very often does not increase labor's productivity.

Examination of many construction jobs reveals serious shortcomings in the mechanization of construction work. Machines, especially concrete mixers and rock crushers, were far from being fully utilized. Proper use of the available construction machines would permit an increase in productivity of 50 percent.

Basic causes of inadequate utilization of available machinery include the following:

Excavators often are not provided with the necessary dirt-hauling trucks or railroad cars. Many big scrapers cannot operate because of shortages in truck-tractors. Railroad cars and trucks are idle for long periods because of shortages in mechanical loaders or cranes. In many cases there are shortages in dumping vehicles (railroad dump cars, dump trucks, etc.).

When average-sized concrete or mortar mixers (150 - 375 liters) are used on small, individual jobs, they are not being utilized efficiently. When big concrete plants have to set up 4 - 8 average-sized concrete mixers instead of 1 - 2 big ones, the whole mechanization process is slowed down and labor productivity is lowered.

The lack of spare parts for machines and unsatisfactory maintenance in certain organizations makes major repairs for machines necessary every few months. When current repairs are made locally, the spare parts used are often of low quality.

There are cases of improper calculation of the level of production. The degree of mechanization of a whole process is based upon some one operation. For example, in the removal of dirt by excavators the subsequent dumping, levelling and packing of the dirt removed are all done by hand. It is wrong to consider the whole process of dirt removal mechanized since 10 - 12 men are employed in hauling dirt and additional equal numbers work in dumping and levelling dirt at the dumping ground by hand.

Many people consider the production of concrete completely mechanized when actually only one phase of the whole process, the mixing carried out in the concrete mixer, is mechanized. The delivery and pouring of the cement and inert materials are still done by hand. Six to 10 manual workers to carry materials to the machine in wheelbarrows must be employed for every man operating the mechanical cement mixer.

The existing practice for calculating the degree of mechanization of work does not distinguish between the manufacture of concrete in individual concrete mixers and in completely mechanized concrete plants, although the output of one workers for the mixer is 6 - 10 cubic meters of concrete and for the plant 70 cubic meters per shift.

The existing practice does not contribute to the introduction of machines and actually hinders the maintenance of the present levels of mechanization in construction. Considerable changes must be introduced to give precise information on the degree of mechanization of every phase of the production process and, at the same time, of the process as a whole. The chief criterion of the degree of mechanization of working processes must be economy of labor, i.e., the lowering of labor outlay in the mechanized processes as compared with that of the hand processes.

A single, clear system for calculating the degree of mechanization, applicable to all construction ministries and departments, must be set up. This system should be developed by the construction scientific research institutes and carefully tested in practice.

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The Ministry of Construction- and Road-Machine Building has achieved great success in mass production of many types of construction machines: 5-ton truck cranes, truck graders, excavator cranes with hydraulically driven buckets of 0.5 - 1-cubic meter capacity, concrete mixers with 1,200-liter capacity, equipment for the manufacture of slag blocks, etc.

A considerable portion of the less complex, but very necessary and useful construction machines can and must be produced by the enterprises using them. The Ministry of Heavy Machine Building is rather successfully coping with this problem, organizing the manufacture of machines, such as hoisting and loading cranes of small lifting capacity (up to 3 tons), 40-ton, "Stal'-konstruktsiya"-type tower cranes, stationary and mobile conveyors (including steel belt types), hand and power-driven hoists, and machines for specific jobs (small compressors, mortar pumps, paint sprayers, etc.).

The work of construction ministries and departments would be more productive if it were coordinated in a single, jointly developed plan. The types of machines to be produced by each ministry for itself and for other departments would be determined by the plan.

Proper utilization and repair of available construction machines is another important problem in the mechanization of construction work. Repair of machines in many construction trusts is still completely unsatisfactory. There is often no planned preventive repair work. Emergency repairs predominate, and the quality of these repairs, carried out by haphazard methods, is very low. The repair shops of even the largest trusts often do not have necessary spare parts and must carry out major repairs by fixing worn out parts rather than by replacing them. Regional plants must be set up to carry out major repair of construction machinery and equipment.

The shortage of qualified personnel is largely responsible for the inadequate and improper employment of available machines, for lost time, and for breakdowns. The training of qualified personnel is one of the most important problems in mechanizing construction. To provide construction with such personnel, we must immediately organize courses for raising the qualifications of engineers and technicians, and yearly schools for training master mechanics.

The existing system of wages for machine maintenance personnel is unsatisfactory. This system does not sufficiently stimulate labor productivity and does not contribute to elimination of lost time. Wages of workers doing machine maintenance work are often lower than wages of construction workers with similar qualifications. Even workers using auxiliary machines are generally paid on a time basis. We must encourage a system of wages for mechanics which will insure smooth operation of machines, fulfillment of quotas, proper maintenance of machines, and an economy in power and fuel.

Machines for removal, transport, dumping, and levelling of dirt constitute the biggest part of the cost of construction machines. Actually about 40 percent of all dirt removal and disposal work can be done by scrapers with buckets of 6 - 8 cubic meters capacity, which are produced by the Ministry of Construction- and Road-Machine Building enterprises and are drawn by the S-80 truck tractor. The scraping method cannot be used effectively on very rocky ground or in the winter, but in all other cases it is far superior to excavating. If the indexes of an excavating column with properly manned

equipment (excavators, dump trucks or railroad dump cars, bulldozers) are considered as being 100 percent, the corresponding indexes of a scraper team, for the same amount of work under normal work conditions and with 200 - 400 meters of haulage, are as follows: labor productivity, 200 - 300 percent; cost of equipment, 60 - 70 percent; cost of work, 40 - 50 percent; consumption of fuel, 45 - 50 percent.

A very important task in the mechanization of construction is the replacement of available construction machines by tractors and machines mounted on tractor chassis, i.e., bulldozers, bucket loaders for loose materials, jib cranes, pit excavators, etc.

Hydraulic pressure is insufficiently employed in industrial construction despite the fact that under favorable topographical conditions with available water and cheap electric power, it is the most progressive method. Combined work by excavators, which remove the dirt from the ground, and hydraulic dredges, which remove the dirt from the excavator by hydraulic pressure, is also very effective. Practice has proved that a worker using this combined method can process 80 cubic meters of dirt in the same length of time that railroad haulage of the dirt from the excavator requires to process 16 cubic meters.

Under favorable natural conditions and with proper organization, complete mechanization by hydraulic pressure (washing out dirt by hoses) is especially effective. For example, the hydraulic dredge ZGM-1 has processed 6,000 cubic meters per day on many jobs. Output per worker using hydraulic dredges is 5 times greater than output of workers using excavators, and the cost is 4.5 times lower.

Construction engineers must pay special attention to quarry mechanization. Many enterprises employ primitive production techniques in the excavation, crushing, and grading of stone.

Because of the low level of mechanization in stone quarries the cost of rubble is very high and the output of workers is very low. As a result, production in construction work which depends on rubble supply, i.e., concrete and reinforced-concrete production, is hindered.

To guarantee the construction industry cheap stone and rubble, the excavating and processing of stone must be increased in the very near future, and the level of mechanization of stone quarries must be raised to the level of mechanization of ore, limestone, and open coal pits. Use of explosives, dump-truck transport, and other successful methods of open-pit mining must be introduced.

Railroads for loading stone and rubble must be laid right up to quarries. Bunkers and other loading facilities must be built on the wharves of river quarries. New and restored quarries must all be mechanized by 1949 - 1950.

The Ministry of Transportation has developed plans for the mechanization of work in stone quarries having annual production of 50,000 - 100,000 cubic meters of stone. By the second year after mechanization, the yearly output of one workers in a quarry having an annual capacity of 50,000 cubic meters will be a minimum of 850 cubic meters; in quarries of 100,000 cubic meters, 1,000 cubic meters; and in those of 250,000 cubic meters, 1,000 cubic meters.

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At present there are at least two workers employed in unloading, storing, and hauling brick or slag blocks for every worker engaged in laying these materials. Under normal conditions these loading and unloading operations require 2.1 - 2.4 working days for every 1,000 bricks. The only way to reduce labor consumption in these processes is to pack the bricks (or slag blocks) in containers at the plant before shipment. Labor consumption in the loading processes is thus reduced 2 - 2.5 times.

The experience of the Moscow Soviet in construction of multistory buildings in 1938 - 1940 has indicated that the use of cranes shortens the time necessary for construction of 6 - 7-story buildings by 7 months. A BKKM-Type tower crane was used, its 25-meter jib spanning the whole of the building under construction and carrying to the bricklayer, at each lift, 196 bricks in two containers. These containers were loaded automatically by various types of machines at the Moscow Soviet's brick plants.

A new-type "self-hoisting" derrick, manufactured by the Ministry of Construction and Road-Machine Building, is currently in use. This derrick is adjusted for the building and can be raised or lowered. The length of the derrick jib is 25 meters. Two of these cranes, each weighing 12 tons, can successfully service the fronts of buildings up to 45 meters high. They not only completely replace the 42-ton BKKM tower crane, but also make the organization of labor more flexible and eliminate the need for railroads to the construction area.

The use of containers is also very important in the mechanization of construction of smaller brick and slag-block construction. Light models of tower cranes and derrick cranes with 17 - 18 meter jibs, with a lifting capacity of 0.5 tons or 120 brick containers when the boom is at a maximum extension, are to be used for this type of construction.

The Ministry of Heavy Machine Building is now manufacturing two models of light tower cranes for 1 - 2- and 2 - 4-story construction.

The "Pioneer" crane (now being mass produced), which has replaced the older "DIP," can be used for single-story buildings. If we take into consideration its weight and low cost of construction, this crane has a great lifting capacity (500 kilograms) and a wide operating radius. It can hoist Mal'tsev-type containers with 42 and 64 bricks to the first story of any building.

Construction of living quarters and industrial buildings is delayed by certain finishing processes which are very labor-consuming and which require highly skilled personnel. For example, 20 percent of all workers employed in construction of living quarters are engaged in plastering.

The great volume of construction work makes mechanization of the finishing processes, plastering and painting, a necessity. Finishing processes (dry plastering, tiling, wainscoting, and roofing) are still poorly applied in construction, and the machines used in these processes do not yet meet the demands of the construction engineers. The construction materials industries and local industries must considerably increase the manufacture of the existing machines and must fundamentally change the nature of the technology of finishing work in construction.

Thirty percent of all construction workers are employed in the industrial enterprises of the construction ministries and departments. The industrial technology of these enterprises, starting with quarries or timber-felling centers, and ending with reinforced-concrete or woodworking combines, is still at a low level and does not meet the requirements for complete mechanization.

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